

NON-PUBLIC?: N  
ACCESSION #: 9310150055  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: SEABROOK STATION PAGE: 1 OF 4

DOCKET NUMBER: 05000443

TITLE: MANUAL REACTOR TRIP DUE TO INADVERTENT MSIV CLOSURE  
EVENT DATE: 05/20/93 LER #: 93-09-01 REPORT DATE: 10/06/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Mr. James M. Peschel, Regulatory TELEPHONE: (603) 474-9521  
Compliance Manager ext. 3772

COMPONENT FAILURE DESCRIPTION:  
CAUSE: X SYSTEM: SB COMPONENT: FSV MANUFACTURER: E095  
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

#### ABSTRACT:

On May 20, 1993, at 0437 EDT, a manual reactor trip from 100 percent power was initiated when a main steam SB! isolation valve (MSIV) closed during MSIV quarterly testing. The trip was followed by a Feedwater Isolation and two Emergency Feedwater actuations. This event was reported to the NRC at 0553 EDT as an immediate notification pursuant to 10CFR50.72(b)(2)(ii), actuation of the Reactor Protection System (RPS) and Engineered Safety Feature (ESF) System.

During MSIV quarterly testing, the MSIVs are alternately stroked to ten percent closed and then reopened. However, one MSIV failed to return to the open position when the ten percent limit was reached, and instead continued to close. The reactor was manually tripped when the narrow range level in the affected steam generator was twenty-two percent and decreasing.

There were no adverse safety consequences as a result of this event.

The cause of the MSIV malfunction was determined to be debris lodged in a hydraulic solenoid valve that allowed the hydraulic pressure keeping the MSIV open to bleed off, resulting in the MSIV drifting closed.

END OF ABSTRACT

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#### Description of Event

On May 20, 1993, at 0437 EDT, plant operators initiated a manual reactor trip from 100 percent power when a main steam isolation valve (MSIV) did not return to the full open position but continued to close during the performance of MSIV quarterly testing.

Seabrook Station is a four loop Westinghouse plant, with an MSIV in each of the four main steam lines. Each MSIV is controlled by a hydraulic/pneumatic actuator that uses nitrogen to maintain pressure on top of an operating piston (which tends to close the MSIV) and hydraulic pressure on the bottom of the operating piston to keep the valve open. There are two hydraulic solenoid operated valves that are used to vent the hydraulic pressure to a reservoir to close the valves. There are two trains of hydraulic control for each MSIV to increase reliability. MSIV operability is verified once per quarter during power operation by cycling each valve through ten percent of valve travel with both trains of hydraulic control using a test panel on the main control board.

The train A test of the four MSIVs had been performed earlier on the shift with all MSIVs cycling properly. Two minor discrepancies, low nitrogen pressure on MSIV A and loose limit switches on MSIV B, were noted. The train B test of MSIV A and C were then completed satisfactorily (MSIV B was not tested using train B due to the loose limit switches). However, when MSIV D was tested, the Senior Control Room Operator noted that the valve failed to stop at ten percent closed. The MSIV's continued closure was verified by indications of steam generator level shrinkage, steam flow reduction from steam generator D, and a delta temperature deviation alarm in the affected reactor coolant loop. Attempts to stop the valve from closing were unsuccessful. Approximately four minutes after the start of the MSIV D test, with steam generator D narrow range level at twenty-two percent and decreasing, the Unit Shift Superintendent ordered a manual trip of the reactor.

The decision to trip the reactor, and the response to the reactor trip and the subsequent recovery actions by plant operators, were determined to be

correct. Primary plant system response was normal with expected Engineered Safety Feature (ESF) actuations (Emergency Feedwater System (EFW) BA! actuation on Steam Generator LO-LO level and Feedwater System SJ! Isolation in response to low Reactor Coolant System temperature). During the response to the reactor trip, the Unit Shift Supervisor (USS) ordered the Senior Control Room Operator (SCRO) to reopen the feedwater isolation valves, as required by the applicable Emergency Response Procedure (ES-0.1, Reactor Trip Response). However, the SCRO did not hear this order, and the USS continued with ES-0.1, verifying the startup feed pump was running with greater than 14 percent level in the steam generators, and then securing the emergency feedwater pump. With feedwater secured, steam generator levels decreased to the LO-LO level setpoint and a second EFW actuation occurred.

At 0553 EDT on May 20, 1993 North Atlantic made a four-hour notification to the NRC pursuant to 10CFR50.72(b)(2)(ii).

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#### Safely Consequences

There were no adverse safety consequences as a result of this event. Plant equipment functioned as designed and operator actions were determined to be correct. At no time during the event was there any impact on the health and safety of plant employees or the public.

#### Root Cause

The root cause of this event was determined to be debris lodged in one of the solenoid valves that align the hydraulic portion of the MSIV operating piston with the hydraulic reservoir. This debris caused the solenoid valve to stay in mid position during the ten percent closure test, permitting the hydraulic fluid to drain from the bottom of the operating cylinder. As the hydraulic pressure in the operating piston fell below the nitrogen pressure on top of the operating cylinder, the MSIV closed.

The debris flushed from the solenoid valve appeared to match the material that comprises the nylon backing rings used in several locations in the valve assembly. This observation was confirmed by an independent laboratory which analyzed the material and compared it to a spare nylon backing ring from Seabrook Station stock. Each location that contains a nylon backing ring of this type was evaluated to determine the effect on the valve assembly of a failed backing ring. Based on this evaluation, North Atlantic concludes that the most likely source of the debris is either the failure of a nylon backing ring in the normally open isolation valve in the hydraulic pump discharge line or that the material was

introduced into the valve internals during the overhaul of the valve at the vendor facility.

The root cause of the second EFW actuation was determined to be incomplete communication between the Unit Shift Supervisor and the control board operator regarding the reopening of the feedwater isolation valves.

#### Corrective Actions

The hydraulic solenoid valves on MSIV D were replaced and the MSIV was tested satisfactorily. The minor discrepancies on MSIV A and MSIV B (low nitrogen pressure and loose limit switches, respectively) have been corrected. In addition, a Human Performance Evaluation was performed for the trip and for the events leading to the second EFW actuation.

The following additional actions are being taken:

1. The failed solenoids from MSIV have been evaluated to determine the mechanism by which the debris was introduced. Based on this evaluation, two additional actions (nos. 7 and 8) have been identified.
2. A logic change to the slow closure circuit is being developed so that the MSIV does not momentarily transfer from slow to fast closure before reopening during the partial closure test.
3. Emergency Response Procedure ES-0.1 will be revised to list the Feedwater Isolation valve numbers.

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4. Other Emergency Response Procedures will be reviewed for the use of specific valve numbers while performing evolutions. Procedure changes will be issued as applicable.
5. The decibel level and frequency for control board alarms will be evaluated to determine if they have been set too high, thereby contributing unnecessarily to the environmental noise level in the control room.
6. The lessons learned from this event will be discussed with all operating crews.
7. The MSIV reservoirs will be drained and the strainer/diffuser in each of the reservoirs cleaned and inspected during the next

refueling outage. The need for rebuilding the actuator seals will be determined based on the results of these inspections.

8. The isolation valve in the hydraulic pump discharge line in the D-MSIV will be inspected during the next refueling outage for signs of damage and repaired, if necessary.

#### Plant Conditions

At the time of this event, the plant was in Mode 1, at 100 percent power, with a Reactor Coolant System temperature of 587 degrees Fahrenheit and a pressure of 2235 psig.

#### Related Events

This is the first event at Seabrook Station where MSIV testing anomalies resulted in a reactor trip.

This is the third event at Seabrook Station where incomplete communication among the operations crew contributed to a Reactor Protection System/Engineered Safety Features actuation. The previous occurrences were reported in LER 92-017 and LER 93-01.

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North P.O. Box 300  
Atlantic Seabrook, NH 03874  
Energy Service Corporation Telephone (603) 474-9521  
Facsimile (603) 474-2987

Ted C. Feigenbaum  
Senior Vice President and  
Chief Nuclear Officer

NYN- 93134

October 6, 1993

United States Nuclear Regulatory Commission  
Washington, D.C. 20555

Attention: Document Control Desk

Reference: Facility Operating License No. NPF-86, Docket No. 50-443

Subject: Licensee Event Report (LER) No. 93-009-01: Manual Reactor

Trip Due to Inadvertent MSIV Closure

Gentlemen:

Enclosed please find Licensee Event Report (LER) No. 93-009-01 for Seabrook Station. This submittal provides supplemental information regarding the root cause determination and corrective actions.

Should you require further information regarding this matter, please contact Mr. James M. Peschel, Regulatory Compliance Manager, at (603) 474-9521, extension 3772.

Very truly yours,

TCF:MJM/act Ted C. Feigenbaum

Enclosures: NRC Forms 366, 366A

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United States Nuclear Regulatory Commission October 6, 1993  
Attention: Document Control Desk Page two

cc: Mr. Thomas T. Martin  
Regional Administrator  
United States Nuclear Regulatory Commission  
Region I  
475 Allendale Road  
King of Prussia, PA 19406

Mr. Albert W. De Agazio, Sr. Project Manager  
Project Directorate I-4  
Division of Reactor Projects  
United States Nuclear Regulatory Commission  
Washington, DC 20555

Mr. Noel Dudley  
NRC Senior Resident Inspector  
P.O. Box 1149  
Seabrook, NH 03874

INPO  
Records Center  
1100 Circle 75 Parkway

Atlanta, GA 30339

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